

## Appendix G:

### Surface Vehicle Systems -- Work Breakdown Structure and Definitions

#### G.1 -- Scope

This appendix provides the surface vehicle system work breakdown structure. Definitions for the primary vehicle and secondary vehicle are provided in this appendix. Definitions for WBS elements common to the surface vehicle and all other defense materiel items are given in Appendix H: Work Breakdown Structure Definitions, Common Elements.

#### G.2 -- Work Breakdown Structure Levels

Level 1	Level 2	Level 3
Surface Vehicle System	Primary Vehicle	Hull/Frame Suspension/Steering Power Package/Drive Train Auxiliary Automotive Turret Assembly Fire Control Armament Body/Cab Automatic Loading Automatic/Remote Piloting Nuclear, Biological, Chemical Special Equipment Navigation Communications Integration, Assembly, Test and Checkout
	Secondary Vehicle	(Same as Primary Vehicle)
	Systems Engineering/ Program Management	
	System Test and Evaluation	Development Test and Evaluation Operational Test and Evaluation Mock-ups Test and Evaluation Support Test Facilities

Training	Equipment Services Facilities
Data	Technical Publications Engineering Data Management Data Support Data Data Depository
Peculiar Support Equipment	Test and Measurement Equipment Support and Handling Equipment
Common Support Equipment	Test and Measurement Equipment Support and Handling Equipment
Operational/Site Activation	System Assembly, Installation and Checkout on Site Contractor Technical Support Site Construction Site/Ship/Vehicle Conversion
Industrial Facilities	Construction/Conversion/Expansion Equipment Acquisition or Modernization Maintenance (Industrial Facilities)
Initial Spares and Repair Parts	

### **G.3 -- Definitions**

#### **G.3.1 -- Surface Vehicle System**

The complex of equipment, data, services, and facilities required to develop and produce a vehicle system with the capability to navigate over the surface. Surface vehicle category includes vehicles primarily intended for general purpose applications and those intended for mating with specialized payloads.

#### ***Includes:***

- cargo and logistics vehicles, mobile work units and combat vehicles
- combat vehicles serving as armored weapons platforms, reconnaissance vehicles, and amphibians

### **G.3.2 -- Primary Vehicle**

The mobile element of the system embodying means for performing operational missions.

***Includes:***

- means of propulsion and structure for adaptation of mission equipment or accommodations for disposable loads
- design, development, and production of complete units (i.e., prototype or operationally configured units which satisfy the requirements of their applicable specifications, regardless of end use)
- Sub-elements to the primary vehicle (G.3.2.1 -- G.3.2.15)

***Note:***     ***All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.***

#### **G.3.2.1 -- Hull/Frame**

The vehicle's primary load bearing component which provides the structural integrity to withstand the operational loading stresses generated while traversing various terrain profiles.

***Includes, for example:***

- simple wheeled vehicle frame or combat vehicle hull which satisfies the structural requirements and also provides armor protection
- structural subassemblies and appendages which attach directly to the primary structure
- towing and lifting fittings, bumpers, hatches, and grilles
- provision to accommodate other subsystems such as mountings for suspension, weapons, turret, truck body, cab, special equipment loads, etc.

***Note:***     ***All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.***

#### **G.3.2.2 -- Suspension/Steering**

The means for generating tractive efforts, thrust, lift, and steering forces generally at or near the earth's surface and adapting the vehicle to the irregularities of the surface.

***Includes, for example:***

- wheels, tracks, brakes, and steering gears for traction and control functions
- rudder thrust devices and trim vanes for amphibians
- springs, shock absorbers, skirts, and other suspension members

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

### **G.3.2.3 -- Power Package/Drive Train**

The means for generating and delivering power in the required quantities and driving rates to the driving member.

***Includes, for example:***

- engine-mounted auxiliaries such as air ducting and manifolds, controls and instrumentation, exhaust systems, and cooling means
- power transport components as clutches, transmission, shafting assemblies, torque converters, differentials, final drivers, and power takeoffs
- brakes and steering when integral to power transmission rather than in the suspension/steering element

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

### **G.3.2.4 -- Auxiliary Automotive**

The group of hardware and software subsystems which provide services to all of the primary vehicle subsystems (as distinguished from the special equipment subsystems) and which outfit the chassis.

***Includes, for example:***

- the vehicle electrical or electronics system, on-board diagnostics/prognostics system, fire extinguisher system and controls, chassis mounted accessories
- the winch and power take-off, tools and on-vehicle equipment
- crew accommodations (when otherwise not provided for)

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

### **G.3.2.5 -- Turret Assembly**

The structure and equipment installations required to provide the fighting compartment element of combatant vehicles.

***Includes, for example:***

- turret armor and radiological shielding, turret rings, slip rings
- attachments and appendages such as hatches and cupolas
- accommodations for personnel, weapons, and command and control

***Excludes:***

- fire control and stabilization system

***Note:***     ***All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.***

**G.3.2.6 -- Fire Control**

The equipment (hardware and software) installed in the vehicle which provides intelligence necessary for weapons delivery such as launching and firing.

***Includes, for example:***

- radars and other sensors necessary for search, recognition and/or tracking
- controls and displays
- sights or scopes
- range finders, computers, computer programs, turret and gun drives, and stabilization systems

***Note:***     ***All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.***

**G.3.2.7 -- Armament**

The means for combatant vehicles to deliver fire on hostile targets and for logistics and other vehicles to exercise self-defense.

***Includes, for example:***

- main gun, launchers, and secondary armament

***Excludes:***

- Fire control systems

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.8 -- Body/Cab**

The major component to be mated to a chassis to provide a complete vehicle having a defined mission capability.

***Includes, for example:***

- accommodations for personnel, cargo, and such subsystems as need to be placed in proximity to operators

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.9 -- Automatic Loading**

The equipment (hardware and software) for selecting ammunition from a stored position in the vehicle, transferring it, and loading the armament system.

***Includes, for example:***

- the means to eject spent cases and misfired rounds
- ammunition storage racks, transfer/lift mechanisms, ramming and ejecting mechanisms, as well as specialized hydraulic and electrical controls

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.10 -- Automatic/Remote Piloting**

The equipment (hardware and software) installed in the vehicle used to plan and control vehicle speed and direction either autonomously or via tele-operation.

***Includes, for example:***

- equipment which senses, processes and displays imagery data -- stereo vision systems; laser scanners; multiple sensor-fusion algorithms and processors; image-enhancement algorithms and processors, etc.
- equipment which performs intelligence analysis and planning functions -- automated route planners; image-understanding algorithms and processors; computer-aided-driving algorithms and processors, etc.

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.11 -- Nuclear, Biological, Chemical**

The subassemblies or components which provide nuclear, biological, chemical protection and survivability to the vehicle crew, either individually or collectively, during a nuclear, biological, chemical attack.

***Includes, for example:***

- a positive pressure system; micro-climate cooling; air conditioning and purification system; ventilated face piece (mask); nuclear, biological, chemical detection and warning devices; decontamination kits; and chemical resistant coatings

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.12 -- Special Equipment**

The special equipment (hardware and software) to be mated to a chassis or a chassis/body/cab assembly to achieve a special mission capability.

***Includes, for example:***

- all items required to convert basic vehicle configurations to special-purpose configurations
- blades, booms, winches, robotic arms or manipulators, etc., to equip wreckers, recovery vehicles, supply vehicles and other field work units
- furnishings and equipment for command, shop, medical and other special-purpose vehicles

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.13 -- Navigation**

The equipment (hardware and software) installed in the vehicle which permits the crew to determine vehicle location and to plot the course of the vehicle.

***Includes, for example:***

- navigation systems such as dead reckoning, inertial, and global positioning systems

- landmark recognition algorithms and processors

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.14 -- Communications**

The equipment (hardware and software) within the system for commanding, controlling, and transmitting information to vehicle crews and other personnel exterior to operating vehicles.

***Includes, for example:***

- radio frequency equipment, microwave and fiber optic communication links, networking equipment for multiple vehicle control, and intercom and external phone systems
- means for supplementary communication like visual signaling devices
- Navigation system and data displays not integral to crew stations in the turret assembly or the driver's automotive display in the cab.

**Note:** *All effort directly associated with the remaining level 3 WBS elements and the integration, assembly, test, and checkout of these elements into the primary vehicle is excluded.*

#### **G.3.2.15 -- Integration, Assembly, Test, and Checkout**

The integration, assembly, test, and checkout element includes all efforts as identified in Appendix H: Work Breakdown Structure Definitions, Common Elements, to provide a complete surface vehicle.

### **G.3.3 -- Secondary Vehicle**

The vehicles required to supplement, expand, or otherwise contribute to the capabilities of primary vehicles to provide the vehicle system with the required operational characteristics.

Secondary vehicles are not necessarily self-contained operational units capable of operating outside the system.

***Includes:***

- cargo and tank trainers of truck-trailers systems; carriers and tanker units of articulated train-type systems; and transporters as employed in systems when the primary vehicle has limited roadability
- the design, development, and production of complete units (i.e., prototype or operationally configured units which satisfy the requirements of their applicable specification(s), regardless of end use)



***Note: Work breakdown structure and definitions for Secondary Vehicle are the same as those for the primary vehicle.***

#### **G.3.4 -- WBS Common Elements**

Definitions for common WBS elements applicable to the surface vehicle and all other defense materiel items are in Appendix H: Work Breakdown Structure Definitions, Common Elements.